

CLAIMS

- [c1] 1. A method for mounting a microelectronic device to a circuit board, comprising:
- depositing a flowable dielectric compound onto an exposed ball-pad in an opening of the packaged microelectronic device;
- placing a solder-ball onto the ball-pad so that the dielectric compound electrically insulates the ball-pad and the solder-ball from any exposed portion of a trace line adjacent to the ball-pad in the opening; and
- attaching a contact on the circuit board to the solder-ball of the microelectronic device.
- [c2] 2. The method of claim 1 wherein depositing a flowable dielectric compound comprises dispensing a dielectric flux onto the ball-pad.
- [c3] 3. The method of claim 1 wherein depositing a flowable dielectric compound comprises dispensing a dielectric flux comprising epoxy resins, an aliphatic amine complex, and an aromatic amine derivative.
- [c4] 4. The method of claim 1 wherein depositing a flowable dielectric compound comprises dispensing a dielectric flux comprising 50-90 percent epoxy resins, 10-50 percent aliphatic amine complex, and 3-7 percent aromatic amine derivative.
- [c5] 5. The method of claim 1 wherein depositing a flowable dielectric compound comprises dispensing a dielectric flux comprising a no flow underfill.
- [c6] 6. The method of claim 1 wherein:
- a eutectic paste is on the contact on the circuit board; and

attaching a contact on the circuit board to the solder-ball comprises pressing the solder-ball into the eutectic paste.

[c7] 7. The method of claim 1, further comprising etching away a portion of a solder-mask on the packaged microelectronic device creating the opening.

[c8] 8. The method of claim 1 wherein depositing a flowable dielectric compound comprises screen printing the flowable dielectric compound onto the ball-pad.

[c9] 9. The method of claim 1 wherein depositing a flowable dielectric compound comprises dispensing the flowable dielectric compound onto the ball-pad with a pin transfer mechanism.

[c10] 10. The method of claim 1 wherein depositing a flowable dielectric compound further includes dispensing the flowable dielectric compound onto an exposed portion of the trace line adjacent to the ball-pad in the opening.

[c11] 11. The method of claim 1, further comprising at least partially curing the dielectric compound before attaching a contact on the circuit board to the solder-ball.

[c12] 12. The method of claim 1, further comprising curing the dielectric compound after attaching a contact on the circuit board to the solder-ball.

[c13] 13. A method for mounting a packaged microelectronic device to a circuit board, comprising:

placing a solder-ball onto a ball-pad on the microelectronic device proximate to an exposed portion of an adjacent trace;

depositing a dielectric compound proximate to a contact on the circuit board;

displacing at least part of the dielectric compound such that at least part of the dielectric compound covers the exposed portion of the adjacent trace; and

attaching a contact on the circuit board to the solder-ball of the microelectronic device.

[c14] 14. The method of claim 13 wherein:

a eutectic paste is on the contact on the circuit board; and

attaching a contact on the circuit board to the solder-ball comprises pressing the solder-ball into the eutectic paste.

[c15] 15. The method of claim 13 wherein depositing a dielectric compound comprises dispensing a dielectric flux proximate to the contact on the circuit board.

[c16] 16. The method of claim 13 wherein depositing a dielectric compound comprises dispensing epoxy resins, an aliphatic amine complex, and an aromatic amine derivative.

[c17] 17. A method for mounting a packaged microelectronic device to a circuit board, comprising:

covering ball-pads on an interposer substrate with a solder-mask;

forming an opening in the solder-mask over a ball-pad on the interposer substrate;

depositing a dielectric compound in the opening;

placing a solder-ball onto the ball-pad;

attaching a contact on the circuit board to the solder-ball of the microelectronic die; and

curing the dielectric compound so that the compound electrically insulates the ball-pad and the solder-ball from an adjacent trace line.

[c18] 18. The method of claim 17 wherein depositing a dielectric compound in the opening comprises dispensing a dielectric flux in the opening.

[c19] 19. The method of claim 17 wherein depositing a dielectric compound in the opening comprises dispensing a dielectric flux comprising epoxy resins, an aliphatic amine complex, and an aromatic amine derivative.

[c20] 20. The method of claim 17 wherein forming an opening in the solder-mask comprises etching a hole in the solder-mask.

[c21] 21. The method of claim 17 wherein:
a eutectic paste is on the contact on the circuit board; and
attaching a contact on the circuit board to the solder-ball comprises pressing the solder-ball into the eutectic paste.

[c22] 22. A method of manufacturing a microelectronic device, comprising:
covering ball-pads on an interposer substrate with a solder-mask;
forming an opening in the solder-mask over a ball-pad on the interposer substrate;
depositing a dielectric compound in the opening; and
placing a solder-ball onto the ball-pad so that the dielectric compound electrically insulates the ball-pad and the solder-ball from any exposed portion of a trace line adjacent to the ball-pad in the opening.

[c23] 23. The method of claim 22 wherein depositing a dielectric compound comprises dispensing a dielectric flux.

- [c24] 24. The method of claim 22 wherein depositing a dielectric compound comprises dispensing a dielectric flux comprising epoxy resins, an aliphatic amine complex, and an aromatic amine derivative.
- [c25] 25. The method of claim 22 wherein depositing a dielectric compound comprises dispensing a dielectric flux comprising 50-90 percent epoxy resins, 10-50 percent aliphatic amine complex, and 3-7 percent an aromatic amine derivative.
- [c26] 26. The method of claim 22 wherein depositing a dielectric compound comprises dispensing a dielectric flux comprising a no flow underfill.
- [c27] 27. The method of claim 22 wherein depositing a dielectric compound comprises screen printing the dielectric compound into the opening.
- [c28] 28. The method of claim 22 wherein depositing a dielectric compound comprises dispensing the dielectric compound into the opening with a pin transfer mechanism.
- [c29] 29. The method of claim 22 wherein depositing a dielectric compound further includes dispensing the dielectric compound onto an exposed portion of the trace line adjacent to the ball-pad in the opening.
- [c30] 30. The method of claim 22, further comprising at least partially curing the dielectric compound.
- [c31] 31. The method of claim 22 wherein forming an opening in the solder-mask comprises etching a hole in the solder-mask.

[c32] 32. A method of manufacturing a microelectronic device, comprising:
 covering a ball-pad on an interposer substrate with a solder-mask;
 forming an opening in the solder-mask over the ball-pad on the interposer
 substrate;
 depositing a dielectric compound on the ball-pad; and
 placing a solder-ball onto the ball-pad so that the dielectric compound is
 displaced and surrounds a perimeter portion of the solder-ball.

[c33] 33. The method of claim 32 wherein depositing a dielectric compound
 on the ball-pad comprises dispensing a dielectric flux onto the ball-pad.

[c34] 34. The method of claim 32 wherein forming an opening in the solder-
 mask comprises etching a hole in the solder-mask.

[c35] 35. A method of manufacturing a packaged microelectronic device
 having a die including a bond-pad and an interposer substrate including at least
 one ball-pad electrically coupled to the bond-pad on the die, comprising:
 disposing a solder-mask on an interposer substrate to cover the ball-pad;
 forming an opening in the solder-mask over the ball-pad;
 placing a solder-ball onto the ball-pad; and
 insulating electrically the solder-ball and ball-pad from an exposed portion
 of an adjacent trace line in the opening.

[c36] 36. The method of claim 35 wherein insulating electrically the solder-ball
 and the ball-pad comprises dispensing a dielectric flux into the opening.

[c37] 37. The method of claim 35 wherein forming an opening in the solder-
 mask comprises etching a hole in the solder-mask.

- [c38] 38. A packaged microelectronic device, comprising:
- a microelectronic die having an integrated circuit and a plurality of bond-pads coupled to the integrated circuit;
- an interposer substrate coupled to the die, the interposer substrate having a plurality of ball-pads electrically coupled to the bond-pads on the die and a solder-mask having openings over the ball-pads;
- a plurality of solder-balls arranged so that each solder-ball is in an opening in the solder-mask and contacting a corresponding ball-pad; and
- a dielectric compound in the openings in the solder-mask, wherein the dielectric compound surrounds a perimeter portion of each of the ball-pads and the solder-balls.
- [c39] 39. The device of claim 38 wherein the dielectric compound includes a dielectric flux.
- [c40] 40. A packaged microelectronic device, comprising:
- a microelectronic die having an integrated circuit and at least one bond-pad coupled to the integrated circuit;
- an interposer substrate coupled to the die, the interposer substrate having at least one ball-pad electrically coupled to the bond-pad on the die, a trace line adjacent to the ball-pad, and a solder-mask having an opening over the ball-pad;
- a solder-ball on the ball-pad; and
- a dielectric compound in the opening in the solder-mask that electrically insulates the ball-pad and the solder-ball from any exposed portion of the adjacent trace line in the opening.
- [c41] 41. The device of claim 40 wherein the dielectric compound includes a dielectric flux.

[c42] 42. The device of claim 40, further comprising a circuit board having a contact coupled to the solder-ball.

[c43] 43. The device of claim 42, further comprising a eutectic paste proximate to the contact.

[c44] 44. The device of claim 40, further comprising a eutectic paste proximate to the solder-ball.

[c45] 45. The device of claim 40 wherein the dielectric compound in the opening covers an exposed portion of the adjacent trace line.